



Chemical Validation of Standard Laboratory Modules (SLMs™)

Figure 1. The Environmental Chemistry Group at Los Alamos National Laboratory performs analytical validation of the standard laboratory modules™ that analyze trace contaminants in environmental samples.



Task Description

The Contaminant Analysis Automation (CAA) Program is developing SLMs™ for the automated analysis of trace contaminants in environmental samples. Each of these modules will automate one or more of the methods outlined in the EPA Test Methods for Evaluating Solid Waste (SW-846). Each module developed is scheduled to undergo analytical validation by a validation team (the validation team at Los Alamos National Laboratory works for the Laboratory Managers Division of DOE EM-263). Validation of the individual SLMs™ will verify that

- analytical data generated by the automated system are consistent with data generated by manual methods;
- individual SLMs™ are capable of achieving the analytical requirements of trace environmental analysis; and
- the SLMs™ are able to withstand the rigors of automated environmental analysis.

Analytical data that must be consistent with manual data includes

- method detection limits;
- surrogate recoveries;
- matrix spike and spike duplicate recoveries; and
- recoveries of spiked compounds from quality control samples.

In order to be compatible with trace environmental analysis, automated analytical modules must also meet other requirements such as the ability to handle a diverse range of sample matrices and the ability to generate blank samples free of undesirable contaminants. Finally, in order for the modules to be used in an environmental laboratory, prototype SLMs™ must be evaluated for other problems such as software and hardware stability, ease of use and maintenance, and sample throughput before they are released for commercialization.

To evaluate the criteria outlined above, the validation team has designed a series of tests that are consistent with the requirements for analytical methods

currently in use. These tests include blank contamination and cross-contamination evaluations for the method, the analysis of quality control samples, and the analysis of "real" environmental samples. These tests provide information on the overall performance of the automated system. Various matrices ranging from blank materials to silty environmental samples have been used to evaluate the performance of the SLMs™ in terms of the adequacy of the data generated, the mean time between failures, and the mode of failure.

Technology Needs

One estimate of the future need within the DOE and the DoD is given by the EPA document *Cleaning Up the Nation's Waste Sites: Markets and Technology Trends*. This document states that as many as 7,000 DoD sites and 4,000 DOE sites may require characterization and cleanup. This technology enhances the analytical processes used to characterize these sites that could result in significant cost savings.

Accomplishments

- The sonication report has been submitted for approval to the EPA Office of Solid Waste.
- The report for the gel permeation chromatograph system is nearing completion. An analytical procedure detailing the validation approach is also nearing completion.
- The High-Volume Concentrator, designed by Idaho National Engineering Laboratory, has been validated.
- Method and instrument validation has been provided in support of the Organics SAM demonstration scheduled for 1995.

Benefits

Improved sample throughput has been demonstrated using the Soxtec SLM™. This system processed 23 samples using 1.5 employee days compared to five employee days required for the same analysis performed using traditional methods. Considering labor as one of the most expensive components of environmental analysis, this better than three-fold improvement in throughput represents significant cost savings to the DOE.

Improved precision has been demonstrated using the CAA-developed High-Volume Concentrator, which processed 42 samples over a three-day period with an overall relative standard deviation of less than 5%.

Collaboration/Technology Transfer

During the validation of each of the SLM™ modules, the validation team is collaborating with the CAA Program design engineering teams responsible for the fabrication of specific SLMs™. Innovations and suggestions that are developed within the validation team are transferred to the entire CAA Program.

The CAA Program is currently interested in CRADAs (Cooperative Research and Development Agreements) and contracts with third-party laboratories qualified to perform validation. This third-party validation will involve beta-testing of SLM™ technology and will provide third-party feedback with a variety of sample data.

For further information, please contact: Mosaic
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